“ hands,” or small bundles of from six to twelve leaves. Each bundle is tied round with a separate leaf, and in this condition the tobacco is ready for bulking for fermentation.

For fermentation the tobacco, whether in bundles, hands, or separate leaves, is piled up or bulked on the floor in a barn into a solid stack to the height of 5 or 6 feet. Within this stack a process of fermentation is quickly set up, and the temperature of the mass rises steadily till it reaches about 130° F. Great care is now taken to prevent overheating, and to secure the uniform fermentation of all the tobacco. The pile is from time to time taken down and rebuilt, the tobacco from the top going to the bottom, and that exposed at the edges being turned in to the centre. In from three to five weeks the fermentation should be sufficiently carried out, and the leaves then have a nice uniform brown colour. The cured stack may in this condition be piled up in store without fear of further fermentative activity, till, with increasing summer heat, it is subject to the May sweat, which renders further watch­fulness necessary.

The components of tobacco, like those of all vegetable matters, arrange themselves under the three heads of water, mineral acids and bases (which pass into the ash on combustion), and organic substances. According to an investigation carried out by Beauchef in Gay-Lussac’s laboratory, the amount of ash from 100 parts of matter dried at 100o C. is in the roots 6 to 8, in the stems 10 to 13, and in the ribs and leaves 18 to 22 per cent. The greater part of the ash consists of insoluble salts, principally carbonate of lime. The soluble part consists largely of potash salts (KC1, K2CO3, K2SO4), which may amount to from 5 to 35 per cent., and it is remarkable that tobacco contains no soda. In addition to the mineral salts proper, tobacco contains salts of ammonia and nitrates. In the leaf the proportion of nitrates is greater in the rib than in the laminæ. In the former it may amount to as much as 10 per cent. (calculating the nitric acid as KNO3). According to Schloesing (Ann. Chim. Phys., [3], xl. 479), the proportion of (combined) nitric acid in tobacco has nothing to do with its combustibility, that is, the length of time a lighted cigar will glow spontaneously. This quality is a function chiefly of the potash present in combination with organic acids. An incombustible tobacco, i.e., a tobacco which does not keep a glowing ash, contains its organic acids in the form of lime and magnesia salts. The explanation is that, while organic potash salts, being fusible, yield when heated a porous charcoal which glows readily, the corresponding infusible lime salts yield a compact charcoal which is far less combustible. A combustible tobacco can be rendered incombustible by the incor­poration of sulphate or chloride of calcium or magnesium. By cultivation experiments in a potash-free soil, it has been ascertained that chloride of potassium used as a manure does not add to the organic potash salts in the leaves, but the sulphate, carbonate, and nitrate do give up their potash for the formation of organic salts.

Subjoined is an enumeration of the proximate organic com­ponents of tobacco leaves, and their relative proportions in 100 parts, according to the numerous analyses made in the laboratories of the French state tobacco factories :—

Nicotine, C10H14N2, a liquid volatile alkaloid, from 1⋅5 to 9 per cent.

Essential oil,—according to Schloesing, an important element in the flavour of tobacco, although its proportion is exceed­ingly small.

Nicotianine, a solid camphor-like body to which, according to other authorities, the odour of tobacco is principally due.

Malic and citric acids, together 10-14 per cent., calculated as anhydrides.

Acetic acid, very little in fresh leaves, but increasing in their fermentation. In snuff it may rise to 3 per cent.

Oxalic acid, 1 to 2 per cent.

Pectic acid, about 5 per cent.

Resins, fats, and other bodies extractable by ether, 4 to 6 per cent.

Sugar, little in the leaves, more in the stems ; in the fer­mentation it disappears.

Cellulose, 7 to 8 per cent.

Albuminoids, calculated from the nitrogen not present as nicotine, nitrates, or ammonia, about 25 per cent.

Excepting the nicotine, the several organic components of the leaves develop, roughly speaking, pari passu until fructification, when certain components are attracted to the fruit, suffering chemical changes while so moving. The nicotine determines the strength of a tobacco, but not its flavour or aroma. The manure supplied to a tobacco field does not increase the proportion of nicotine, but affects only the weight of the crop. The percentage of nicotine in the leaves may to some extent be modified in cultiva­tion,—plants wide apart developing few leaves, but these thick, fleshy, and rich in nicotine, while closely packed plants throw out numerous but thin and membranous leaves having little nicotine. The proportion of nicotine present increases with the age of the plant. Schloesing found in leaves at various stages of growth the following percentage of nicotine :—May 25 (very young leaves), 0⋅79; July 18, 1⋅21; Aug. 6, 1⋅93; Aug. 27, 2 27; Sept. 8, 3 36; Sept. 25, 4∙32.

Regarding the changes which take place in the manufactured leaf, we take the case of snuff, because with it the chemical changes are carried farthest, and yet, qualitatively speaking, they are of the same nature as those which smoking tobacco undergoes. In the fermentation begun in curing and continued in the sauced leaf, the malic and citric acids and the nicotine undergo partial oxidation. The oxalate of lime and the pectates remain almost unchanged, and there are formed, of intermediate (not fully oxidized) bodies, ammonia, acetic acid, and black humic acid, the last giving to snuff its dark colour. A little methyl-alcohol is also at the same time formed. At this stage the tobacco-leaf is acid in reaction ; but after it is powdered, and again submitted for a prolonged period to a slow fermentation in air-tight boxes, it becomes decidedly alkaline by the ammonia, because, while acetic acid continues to be formed and the ammonia and nicotine remain what they are, the malic and citric acids are progressively destroyed. Unless snuff contains free ammonia it is “flat,” and destitute of pungency.

As to the composition of tobacco smoke, numerous investigations have been made. Kissling (Ding. Polyt. Jour., ccliv. 234-246), experimenting on cigars, found that a large proportion of the nicotine passes unaltered into the smoke. Dealing with a tobacco containing 3⋅75 per cent. of nicotine, he recovered from the smoke 52⋅02 per cent. of the total nicotine consumed, while in the uncon­sumed remains of the tobacco the proportion of nicotine was increased to 5⋅03 per cent. With a second sample of tobacco, having likewise 3⋅75 per cent. of nicotine, the smoke yielded only 27⋅83 per cent. of the total nicotine consumed, and the percentage in the unconsumed remains was raised to 4⋅51. From a tobacco containing only 0⋅30 of nicotine he recovered 84⋅23 of nicotine in the smoke. The composition of tobacco smoke is highly complex, but beyond nicotine the only substances found in appreciable quan­tities are the lower members of the picoline series.

The commercial varieties and the sources of supply of leaf­tobacco are exceedingly numerous. Special qualities of tobacco, as of wines, &c., belong to particular localities, outside of which they cannot be cultivated. These tobaccos are therefore natural mono­polies. Moreover, as is also the case with wines, the crops vary in richness and delicacy of flavour with the seasons of their growth, so that in certain years the produce is of much greater value than in others. Further, the properties of certain classes of tobacco render them specially suitable for cigar-making. Others are best fitted for smoking in pipes ; and there are numerous qualities which are valuable for snuff-making. National tastes and habits again frequently determine the destination of tobacco. Thus heavy, strong, and full-flavoured cigars and tobaccos are in favour in the United Kingdom, while on the Continent lighter and more brisk- burning qualities are sought after, and the materials consumed in the kalians of Persia and the East are not suitable for use in the short pipes of the Western nations.

Of cigar tobaccos the most valuable qualities in the world are cultivated in the north-west portions of the island of Cuba. The district of Vuelta Abajo is the source of the highest quality, after which comes the produce of Partidas and Vuelta Arriba. A large portion of the tobacco is made into cigars in the island, but con­siderable quantities are also exported to Europe and the United States for mixing with commoner qualities to give Havana character to the home-made cigars. In recent years a large export of tobacco from Brazil, especially from the province of Bahia, has sprung up, most of which goes to Germany and Austria for cigar-making. The “seed-leaf" tobacco of Pennsylvania, Connecticut, and Ohio, grown from Havana seed, is devoted to cigar-making in the United States. In the East the most important cigar-tobacco region is the Philippine Islands, from which come the well-known Manila cheroots and cigars and a large quantity of leaf-tobacco of dis­tinctive aroma. Immense quantities of cigar tobacco are also ex­ported from Java and Sumatra, most of which passes through the markets of Amsterdam and Rotterdam. In the Madras presidency and in Burmah cigar tobacco is largely cultivated, the strong heavy qualities of which are well known to the British public in the Burmese, Lunka, and Dindigul cheroots.

Of ordinary smoking tobacco, among the most esteemed quali­ties are Varinas or kanaster, grown in the districts of Varinas, Merida, Margarita, &c., in Venezuela. The name kanaster, which covers several varieties of tobacco from South America, is given on account of the wicker baskets (Span. kanastra) in which the material is packed for export. The tobacco regions of the United States—Kentucky, Maryland, Virginia, and Ohio—send great sup­plies of smoking leaf of various qualities into the European market, especially into the United Kingdom, which is almost exclusively supplied from these sources. Smoking tobaccos of the highest quality, rivalling indeed the cigar tobacco of Cuba in flavour and value, are grown in Turkey, and specially in the province of Salonica. The famous Latakia of the English smokers is pro­duced in the province of Saida, in the northern part of Syria (see